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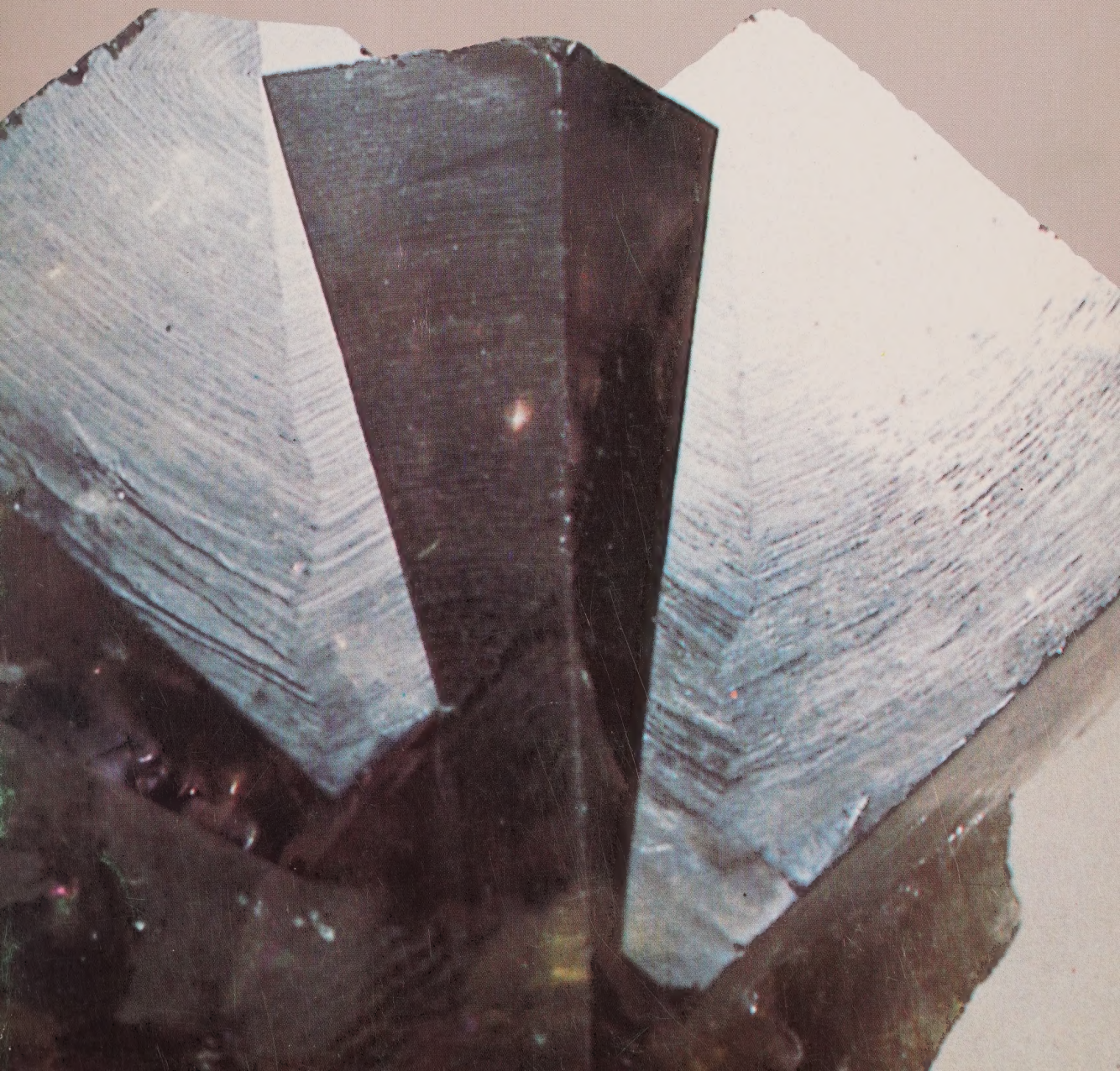
ROTUNDA

Fall 1971
Volume 4, Number 4

FROHBERG MINERALS
ONTARIO'S EARLY MAN
SEA DRAGONS



ROTUNDA

the bulletin of The Royal Ontario Museum
Volume 4, Number 4, Fall 1971

Contents

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The cover: Fluorite crystals (twinned), Weardale, England. See story on page 5. Photograph by Julius Weber.

Spotlight with the Editor

Past, present and future at the ROM

Noah Torno, M.B.E., Chairman of the Board of Trustees.

Photograph by Ashley & Crippen

NEW ROM CHAIRMAN

Noah Torno, M.B.E. has, by order in Council, been appointed Chairman of the Board of Trustees of the Royal Ontario Museum.

Mr. Torno, who has served on the ROM Board since 1968, succeeds Richard G. Meech, Q.C. who has been Chairman of the Board for the last three years. He will continue to serve as a Trustee.

Another change is that W. B. Harris succeeds O. D. Vaughan as an *ex-officio* member by virtue of his appointment to Chairmanship of the Board of Governors of the University of Toronto.

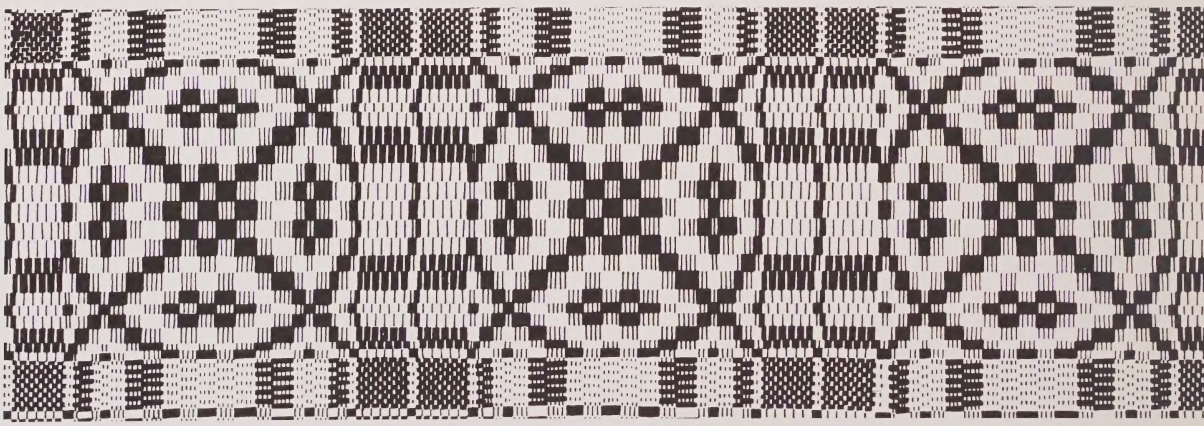
In voting by the membership at large, Clair Stewart retained his position as Trustee.

KEEP ME WARM ONE NIGHT

There's still time to see the most impressive exhibition of early handwoven textiles from Eastern Canada. "Keep Me Warm One Night" which contains more than 300 items will be in Exhibition Hall until the end of the month.

The result of 25 years research, travel and study by Textiles Department Curator, Harold Burnham and his wife Dorothy, the show also owes much credit to the department's Associate Curator, Mrs. K. B. Brett.

All the pieces are from the ROM collection. Indeed it is the first time that the collection has been shown in its entirety. A good time to come is at 2 p.m. when there are free escorted tours of the exhibition. Running concurrently in the Textile Gallery is a showing of handwoven blankets, coverlets and linens from the United States and Europe.



19th century coverlet pattern from Cape Breton, "Keep Me Warm One Night," lends its name to current textiles exhibition.

LICENSED LOUNGE

The Members' Lounge now is licensed. The atmosphere is quiet and club-like; the furnishings comfortable in the extreme. It's the ideal spot for a quiet drink and conversation.

Being a club it is, of course, for museum members only and you should bring your membership card. A member may bring up to three guests, but we request that the same guests not be invited more than once a month. We also ask that men wear jackets and ties. Hours when the bar will be open are from 12 to 2.30 p.m. Monday to Saturday, 5 to 9 p.m. Tuesday to Saturday and 5 to 7.30 p.m. on Monday.

CAFETERIA SCULPTURE

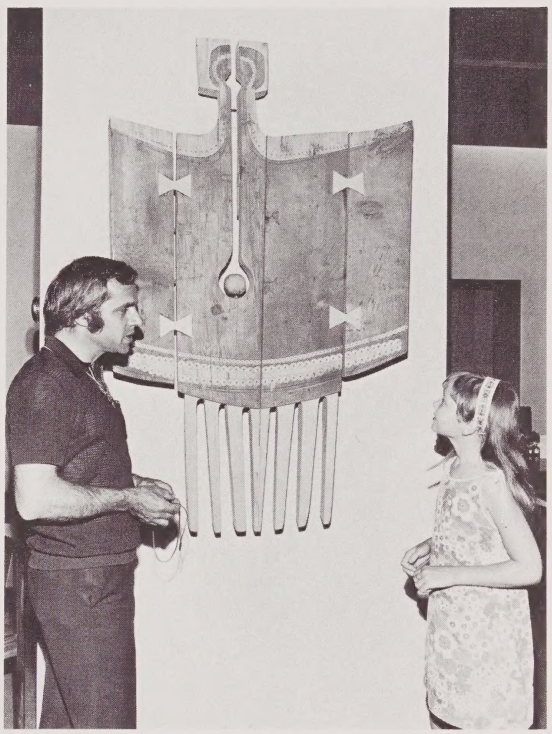
Upstairs in the cafeteria a large sculpture now graces the scene.

Sculpted by Emil Van der Meulen in old barn timber and concrete it represents almost anything the diner wishes. The artist, however, gives it the title ROM Phoenix—the bright promise of the future rising.

LONGER OPENING HOURS

The number of visitors to the Museum increases each year. This year the total is likely to be in the area of one and one half million. Now, in a move that makes the Museum available to even more people and at times more suitable to them, the Museum remains open six evenings each week.

The new opening hours already in effect are as follows: Monday 10-5; Tuesday to Saturday 10-9; Sunday 1-9. The restaurant, too, will be open during these hours.



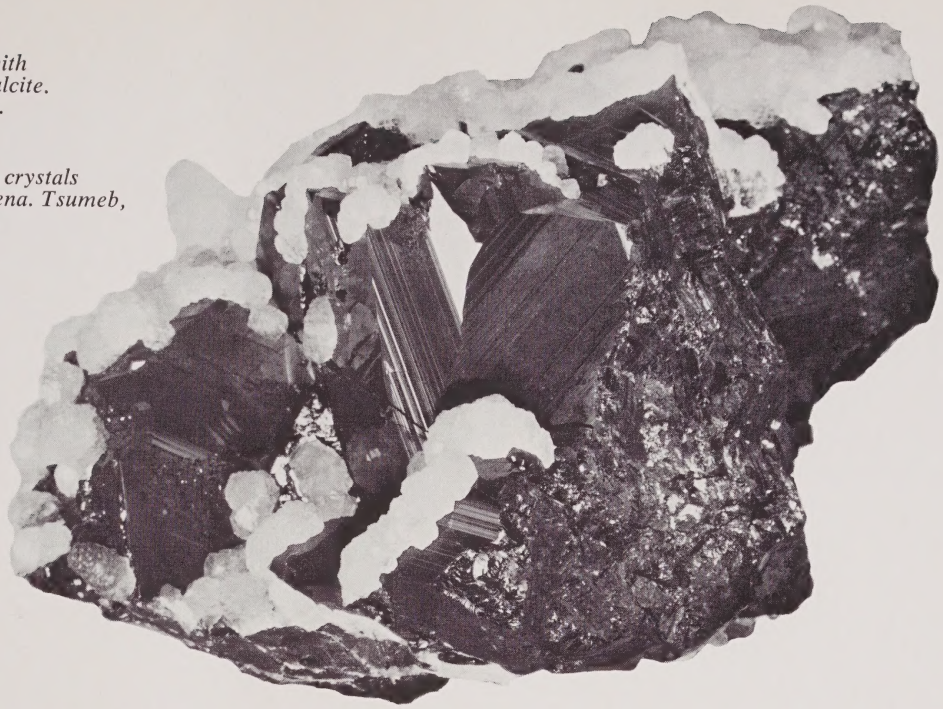
ROM Phoenix, *sculptured in wood and concrete, adorns the cafeteria.*

The newly licensed Members' Lounge

Fig. 1. Quartz, variety smoky. St. Gotthard, Switzerland.

Fig. 2. Sphalerite with arsenopyrite and calcite. Trepča, Yugoslavia.

Fig. 3. Smithsonite crystals on fine-grained galena. Tsumeb, South West Africa.



Dr. M. Hans Frohberg, (†August 30, 1970) was for many years an ardent benefactor of the Royal Ontario Museum, and it was his wish that his and Mrs. Frohberg's mineral collection would some day find a permanent home in our museum. Through the most generous donation of the International Nickel Company, this has been done.

There is little doubt that Dr. Frohberg owned the finest private mineral collection in Canada. It comprises some 3500 specimens, including many unique display minerals, large suites of gold and silver, and some priceless

THE FROHBERG COLLECTION

A most outstanding mineral collection comes to ROM

by J.A. Mandarino, Curator of Mineralogy

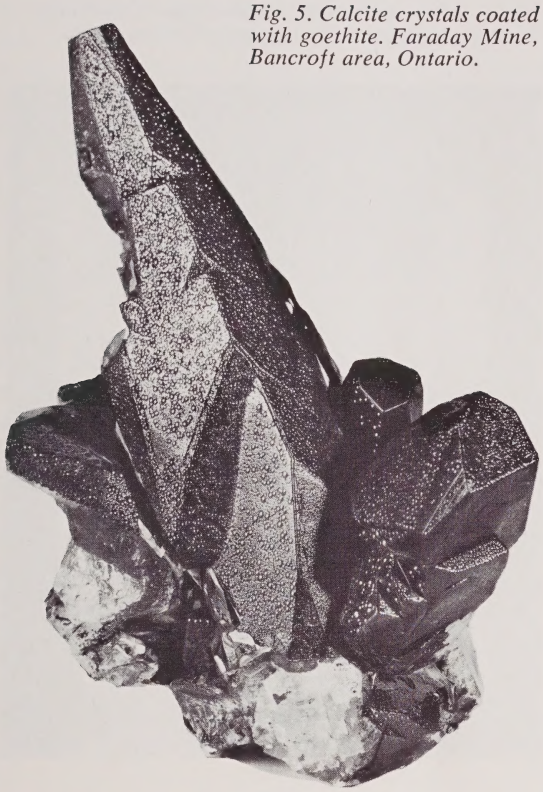


Fig. 5. Calcite crystals coated with goethite. Faraday Mine, Bancroft area, Ontario.

reference material. It is the most remarkable mineral collection the ROM has acquired in the past twenty-five years, ranking only behind the Dorfman Collection as the finest in the museum's history.

Dr. Frohberg came to this country from his native Germany in 1934, as a young man with a doctorate from the Freiberg Bergakadamie. He quickly became one of Canada's foremost mining consultants. For over thirty years he travelled tirelessly around the globe, evaluating properties for international mining companies. His peripatetic journeys placed him in an enviable position as a collector, providing him with a splendid opportunity to acquire specimens in remote, untravelled areas of the world.

Frohberg was a collector's collector. He was superbly fitted by education, experience and native ability for his avocation. He had an uncanny knack for detecting unknown minerals: where other experts had to rely on X-ray machines, he could often get the same results with a simple hand lens. Furthermore, he enjoyed extraordinary rapport with mining men and collectors. Busy miners moving tons of ore seldom bother with individual hand-specimens, but they did for him. Friendly miners

Fig. 4 (opposite page). Smithsonite of unusual green colour. Otavi Mine, South West Africa.

Fig. 6. Kyanite in muscovite schist. Pizzo Torno, Tessin, Switzerland.

would carefully pick out and preserve rare and unusual minerals which ordinarily would have been tossed on the dumps. He enjoyed the same magic success with collectors. He was a forthright, straightforward man who simply did not know how to curry favour or flatter a prospect, and yet, collectors who gave nothing away, gave to him.

The Frohberg Collection is presently housed in rather makeshift conditions waiting the cataloguers. Most of it still sits in the original steel filing cabinets. The more remarkable specimens are spread over three lab tables and overflow onto the floor in a dozen wooden trays. Visitors escorted there for a preview have to step carefully, but these haphazard arrangements never deter them from uttering astonished cries of delight.

Non-collectors may wonder just what makes a collection valuable. Is it the size of the specimens? Is it their rarity? What peculiarities and distinguishing features lend it value?

The beginner can readily see the difference between the reference and the display material. The reference material, although of intense interest to the scientist, looks drab and nonde-

Fig. 7. Danburite crystal. Charcas, San Luis Potosi, Mexico. Photograph by Leighton Warren, ROM.

script beside the show minerals. The show minerals have a transparent, gemmy appearance, with edges so cleanly cut they could have been tooled on a precision machine. The overhead lights bounce off these precisely angled prisms, dazzling the eye. One marvels that these incredibly sharp and pristine surfaces ever lay buried beneath the earth or embedded in rock.

The two tables of display material look equally beautiful, and the amateur might conclude that they are equally valuable. The knowledgeable mineral collector knows, however, that the minerals on the first table are unique; he never saw their like before and he may never see their equal again. That beautiful feldspar on the second table might be one in a thousand, but the danburite crystal on the first table may well be the only one in the world.

In Figure 7, you can see this danburite. It's a perfect crystal of transparent, almost gem-like quality. We already had a fine danburite, but the Frohberg danburite is easily twice as large. I have never seen a larger one.

Clearly, size is an important criterion; but the biggest isn't always the best. I think perfection of form is the most important single quality in a mineral, and I would always choose the smaller, more perfect specimen over the larger, flawed example, although some curators might disagree. In the Frohberg danburite, however, no sacrifice need be made. We have the best of both worlds.

Sometimes a mineral is noteworthy for its association with another mineral. Take the kyanite in Fig. 6. Kyanite is named from the Greek word meaning "blue." It often occurs in a matrix of grey or black rock, where the blue colour is lost against the darker background. The Frohberg kyanite, on the other hand, was formed in a matrix of mica schist, a white rock which beautifully complements the blue.

Galena and quartz are both common minerals, but see the superb example in Fig. 8. The galena is so artfully set off between the two sprays of quartz crystals that the specimen resembles a floral arrangement.

A mineralogical curiosity is the boulangerite (Fig. 11). It sits in a small cardboard box with a piece of clear plastic wrap over the top, looking very like a porcupine in a cage. However, a closer scrutiny reveals that the "quills" of the porcupine are really several hundred fragile

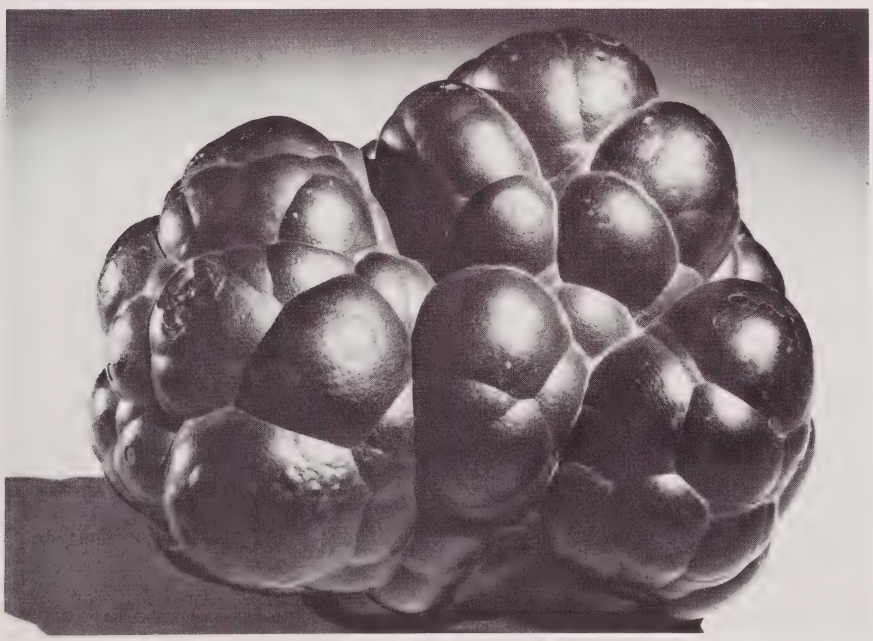


Fig. 8 (opposite page). Galena and quartz crystals. Trepča, Yugoslavia.

Fig. 9. Cassiterite, variety "wood tin." Mina Veta Honda, Guanajuato, Mexico.

crystals as thin as hair, two or three inches long, and densely packed on a matrix of quartz. The specimen came from a mine in Yugoslavia. How these incredibly fragile glass-like strands were dug out of the rock and carried thousands of miles without splintering is a mystery.

Another curiosity is the twisted quartz. Quartz is the most common mineral in any collector's possession. However, the quartz in Fig. 1 displays an extraordinary kind of growth. Starting to grow in the usual manner, the crystal suddenly seemed to change its mind and its direction. Subsequent growth formed a spiral. No one knows why a crystal should depart from its normal growth pattern, and mineralogists study this puzzling phenomenon just as biologists study abnormal cell development.

Dr. Frohberg was especially interested in gold and silver specimens and he has samples of both from all over the world. In the wooden trays on the floor are gold samples in all shapes and sizes. Placer gold, chunks of gold, smears of gold; some gold has taken such exquisitely delicate forms and shapes, as if the finest goldsmith had already worked it into brooches, pins and ornaments, that it looks incongruous, sitting in its natural habitat on the harsh and ugly rocks.

One could go on indefinitely describing the lovely things in the Frohberg collection. The other photographs show a few more specimens whose aesthetic appeal is readily apparent.

Surprising as it may seem, one of the most valuable additions to the Frohberg collection is the data on the file cards, information which is so often missing from private collections. Frequently, mineral collectors collect minerals without noting where and what they've collected. This is regrettable: until it's properly identified, the most promising mineral specimen is just another paper-weight. Frohberg's filing system was extraordinary. With enviable thoroughness, he made a file card for each of the 1500 specimens; only the duplicates went unrecorded. Each card contained the name of the mineral, the variety, a one-line description, the location where found, the donor, and the date he received the specimen. Even museums seldom have such detailed records.

As a result of his labours, one can tell exactly where each Frohberg specimen came from. This is especially important with his reference material. We are happy to know that certain suites of minerals came from Great Bear Lake and other famous mines which have been shut down and flooded and cannot be entered for future study. They are irreplaceable.

We owe a special debt of gratitude to the International Nickel Company, who provided the funds to acquire the Frohberg Collection. INCO's generosity is not unknown in this department. The company gave ROM $150,000 eight years ago to reconstruct the mineral gallery. After such a recent kindness we did not like to ask them again. Only when all other efforts to seek assistance failed, did we turn to our original Santa Claus.

We also wish to thank Mr. Julius Weber for most of the colour photographs in this article. Julius Weber is a professional New York photographer who, for some inexplicable reason, has fallen in love with the ROM. His whirlwind

Fig. 10. Silver wires with stephanite on calcite. Cobalt Lode Mine, Cobalt, Ontario.

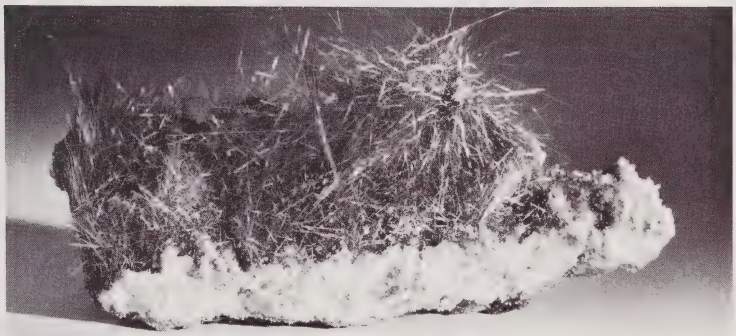
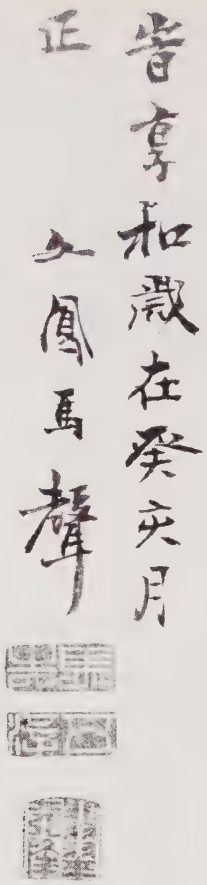


Fig. 11. Boulangerite. Trepča, Yugoslavia.

appearance here last spring to photograph specimens for us, unsolicited, for no remuneration, and out of the kindness of his heart, happily coincided with the acquisition of the Frohberg Collection. With some wooden blocks and some coloured backdrops, and some very sophisticated photographic equipment that he designed himself, he spent a morning on the Frohberg minerals with the gratifying results you see here.

In closing, I'd like to speak of the very special bond which sometimes develops between the private collector and the curator, two people drawn together by a mutual love, such as minerals. Although the Frohberg Collection is a very welcome addition to the mineral collections of the ROM, I cannot help experiencing a feeling of sadness whenever I see it. How many times I have viewed these very minerals in friendly visits to the Frohberg home. How many times has he come here after a consulting trip to show us his new acquisitions. How many minerals remind me of the many others he gave the museum during his lifetime. In leaving his collection, he leaves part of himself. And one's natural joy of acquisition is tempered by a sense of sorrow at the loss of a very dear friend.

Dr. J. A. Mandarino began his career at the Royal Ontario Museum in 1959 as Associate Curator of Mineralogy. In 1965 he was promoted to Curator. At present he is Vice-President of the Mineralogical Association of Canada, Canadian Representative to the Joint Committee on Powder Diffraction Standards and Canadian Representative on the Museums Commission of the International Mineralogical Association. His main research interests are new minerals and mineralogical nomenclature, and especially the mineralogy of Mont St. Hilaire, Quebec. Under an NRC Senior Research Fellowship he spent seven months at the Bureau de Recherches Geologiques et Minières, Orleans, France. He has also done much field work in Ontario, Quebec, and Norway.



KAWAMURA BUMPŌ

19th century Japanese artist

by D. Waterhouse

In 1968 Mr. Frank Crane of Toronto presented to the Far Eastern Department of the Royal Ontario Museum an attractive landscape painting by the early 19th century artist Kawamura Bumpō (Pl. 1). Mr. Crane's gift was intended as a farewell gesture to Mr. Henry Trubner, on his leaving the curatorship of the Department to take up a new post at the Seattle Art Museum.

Bumpō is fairly well-known to students of Japanese art as the illustrator of a series of delightful picture-books, which were published in Nagoya, Ōsaka, Kyōto and Edo during the first 25 years of the 19th century, but paintings by him are much less commonly seen.

Japanese accounts of Bumpō are disappointingly meagre, and it is surprising to find that almost no mention is made by Japanese writers of his excellence as an illustrator. Nakada Katsunosuke, in his standard work on Japanese book illustration, *Ehon no kenkyū* (Tokyo: Bijutsu Shuppansha, 1950) devotes only one page to him; but more sympathetic attention has been given to him by Western commentators, notably the pioneering American scholar Mrs. Louise Norton Brown[1] and Mr. Owen Holloway of the British Museum.[2] There are also good collections of Bumpō's illustrated books in Western collections, for example at the British Museum, the Art Institute of

Chicago and the Museum of Fine Arts, Boston.

Although we do not know the dates of Bumpō's life, or any details of it, a certain amount can be reconstructed. He lived in Kyōto, where he held a junior official title, *Bizen sakan*.[3] It is not clear what duties this entailed, nor whether one may infer that he originally came from Bizen Province; but it is worth noting that the great artist Uragami Gyokudō (1745-1821) and his son Shunkin (1779-1846) both came from Bizen, as did another well-known artist of the period, Okamoto Toyohiko (1773-1845). Shunkin was a close friend of the Confucian scholar, poet and painter Rai San-yō (1780-1832), who wrote a preface to one of Bumpō's illustrated books (*Bumpō sansui ikō*, 2 vols., 1824). Both Gyokudō and San-yō were intimates too of the artist and theorist Tanomura Chikuden (1777-1835), who did not live in Kyōto himself, but frequently went there. It is quite likely that Bumpō knew other artists of the day who worked in or near Kyōto, such as Mori Tetsuzan (1775-1841); Matsumura Keibun (1779-1843); Okada Beisanjin (1744-1818) and his son Hankō (1782-1845); and Yamamoto Baiitsu (1783-1856). Bumpō also collaborated with the Kyōto artist Watanabe Nangaku (1767-1813) in illustrating at least two books, *Kaidō soga* (1811) and *Shukei gafu* (1811), copies of which can be seen at the British Museum. He was also a contributor to

Plate 1
Kawamura Bumpō, A scholar in a landscape, *1803. 1.133 cms., w. 46 cms. Gift of Mr. Frank H. Crane (Royal Ontario Museum)*

Opposite page—Signature and seals (detail)

Meika gafu (3 vols., 1814) and to *Keijō gaen* (1814),[4] which later also had a preface by Rai San-yō. These last two works contained plates by most of the leading artists of Bumpō's and the previous generation.

Bumpō is listed in standard works of reference as a pupil of Kishi Ganku (1749-1838), a Kyōto artist who was famous for his sensational paintings of tigers. Ganku was a follower of Shên Nan-p'in, the Chinese painting master who lived in Nagasaki from 1731 to 1733, and who had a great influence on Japanese literati painting in the 18th century; but Ganku's mature style is not that of a follower, and he had many pupils of his own. One may remark, too, that several other Chinese artists visited Japan during the 18th and earlier 19th centuries, — such as I Fu-ch'iu (1720 and 1730); Fei Han-yüan (1734); Fang Chu-ch'uan (1780); Hung Ch'iu-ku and Fei Ch'ing-hu (1780's); Mêng Han-chiu (early 19th century); Lu Yün-ku (1819); and Chiang Chia-p'u (1822). Japanese artists were familiar with the work of other Chinese artists of the period — not to mention earlier Chinese painting — through the illustrated books published in Japan in the second half of the 18th century by Sō Shiseki and Ōoka Shunboku, among others.[5]

Bumpō's style, in fact, does not show any special influence from Ganku. Mrs. Brown[6] cites the influence of Fei Han-yüan, comparing drawings by Bumpō with those in the *Hi Kangen sansui gashiki* (1787), a Japanese album of Fei Han-yüan's work. She says of Bumpō: "His work indicates that he was familiar with many styles and had studied the ultra-impressionism of Buson and the classic Chinese work, as well as Ganku's transmission of Chin Nampin's [*sic*] method." Speaking of him in general terms, she continues: "Bumpō's books although little known in Europe and America, are among the most delightful and typical examples of the work done by the men of these Kyōto schools."

Bumpō's illustrated books show him to have been a versatile artist, not only in his choice of subject — though he specialized in landscapes and figures — but also in the development of his style. The ROM painting belongs to his early years, when he was still drawing in a very Chinese manner, and it also probably

Plate 2
Bumpō gafu
(3 vols., Kyōto & Osaka, 1807-13), Vol. 1, fols. 20b-21a (British Museum)

antedates his association with Rai San-yō. The painting shows a scholar with a staff walking up through a grove of trees to his retreat in the hills. He is followed by a servant carrying baggage. The subject is conventional enough, yet Bumpō handles it with a young man's energy, and his rendering of the text-book shapes of the trees is far from slavish. The painting measures 133 cms. by 46 cms., and is in good condition, except for a pattern of wormage down the centre, and one or two lateral cracks in the paper. It is painted in ink with light colour (pink, green and pale blue). The painting is dated by year-period and cyclical signs to 1803, and signed *Bumpō Basei*, with seals *Basei, Goyū* and *Hisui Yukitaka* (p. 12). The first two are known art-names of the artist. The third seal is unrecorded, but appears to be of the same date. It is applied with somewhat less care, and may be that of a collector, perhaps a friend of the artist. It is to be hoped that further research will answer this question.

Bumpō's first illustrated book, *Bumpō soga*[7] was published in 1800. His second, *Bumpō kanga*, ("Bumpō's Chinese Pictures") appeared

Plate 3
Bumpō kanga
(1 vol., Kyōto & Osaka, 1803), fol. 25a. (British Museum)

Plate 4
Bumpō sansui gafu
(2 vols., Edo, 1821), kon *volume, fols. 30b-31a. (British Museum)*

Plate 5 Kanga shinan, nihen *(Kyōto, 1811), fols. 10b-11a (British Museum)*

in 1803, the same year as the ROM painting. It contains sketches and studies of figures, especially hermits, sages and Taoist deities. Fol. 25a is reproduced here (Pl. 3) from the British Museum copy (OA.511a) for comparison with the ROM painting. One sage in particular, at the lower left of the page, shows a marked resemblance to ours. Bumpō also contributed one plate to a collection of *haiku* published in 1803 under the title *Tokaijō,* of which there is a copy in the British Museum (OA.514a).

A comparison of pages from some of Bumpō's later books is also revealing. The *Bumpō gafu* was a projected series of ten albums, of which only three were published between 1807 and 1813, all to be seen in copies at the British Museum. Pl. 2 is taken from the first volume (fols. 20b-21a), and is a sketch of yet another scholar approaching the gateway of his cottage. In 1811 Bumpō illustrated the second volume of a manual of Chinese-style drawing, *Kanga shinan*, of which the first volume had been done by Tatebe Ryōtai (also called Kanyōsai: 1719-74). Fols. 10b-11a of Bumpō's volume show twin tree-trunks growing in front of a mountain cottage, and beyond them an open gate into the cottage garden (Pl. 5). Both these features can be seen in the ROM painting. Bumpō's fondness both for sages and for twin tree-trunks recurs in a double page (*kon* volume, fols. 30b-31a; Pl. 4) from one of his most polished works, *Bumpō sansui gafu* (2 vols., 1821). This book was published in Edo, unlike his earlier work, which all appeared in Western Japan; and it is no doubt an indication that his fame was spreading.

It can be proved, in fact, that Bumpō's work was known to Edo print artists. Dr. Richard Lane has pointed out that the background of Kuniyoshi's well-known landscape print of

Nichiren in exile on Sado Island is borrowed from Bumpō.[8] It has also been shown that two of Kunisada's best-known landscape prints, 'Momiji-gari no zu' and 'Muchū sansui', are based on plates in *Bumpō sansui ikō* (1824).[9] It might, indeed, be fruitful to investigate further the relationship between *ukiyoe* landscape prints and Kyōto illustrated books, since we know that Kyōto figure plates influenced Edo artists.

Bumpō had an adopted son, Kihō, who illustrated at least three books, all rare; and, according to Mrs. Brown, Bumpō also had two sons of his own, Ippō and Nihō, who illustrated books. Essentially, however, Bumpō was without followers; and, because of his eclecticism, we cannot say that he had any one predecessor. In book illustration it is perhaps the Edo artist Keisai Masayoshi (1761-1824) who comes closest to his style. We may regret that so little study has been made by Japanese or by Western scholars of the life, work and associations of this remarkable and very original artist.

NOTES

(1) Louise Norton Brown, *Block Printing and Book Illustration in Japan* (London: George Routledge & Sons, and New York: E. P. Dutton & Co., 1924), pp. 103-5.
(2) Owen E. Holloway, *Graphic Art of Japan: the Classical School* (London: Alec Tiranti, 1957), *passim.*
(3) Araki Nori (ed.), *Dai Nihon shoga meika taikan* (4 vols., Tōkyō: Dai Nihon Shoga Meika Taikan Kankōkai, 1934), Vol. 1, p. 230.
(4) K. Toda, *Descriptive Catalogue of Japanese and Chinese Illustrated Books in the Ryerson Library of the Art Institute of Chicago* (Chicago, 1931), p. 382, gives 1814 as the postface date of Meika gafu, while Mrs. Brown (*loc. cit.*) says it was published in 1815. Mrs. Brown (p. 105) cites Bumpō as a contributor to *Keijō gaen*, but Toda (p. 378) does not list him among the artists of the Chicago copy of this book.
(5) D. B. Waterhouse, *Harunobu and His Age* (London: The Trustees of the British Museum, 1964), pp. 293-5.
(6) *Loc. cit.*, p. 103-4.
(7) The British Museum copy (OA.511) bears the title *Bumpō shōga.* I have cited the title as given by Mrs. Brown and Nakada.
(8) In his *Masters of the Japanese Print* (London: Thames and Hudson, 1962), p. 288.
(9) See Yamana Kakuzō, *Nihon no ukiyoe-shi* (Tōkyō: Dai-ichi Shobō, 1930), p. 364.

David Waterhouse, Associate Professor in the Department of East Asian Studies, University of Toronto, and Research Associate in the Far Eastern Department, ROM, was born in Yorkshire in 1936. He attended King's College, Cambridge, and was Assistant Keeper, Department of Oriental Antiquities in the British Museum between 1961 and 1964. From 1964 to 1966 he was Fellow of the Center for Asian Arts, University of Washington, Seattle, before coming to Toronto. Professor Waterhouse has recently returned from a 2½-month tour of Japan. His interests range from Oriental art to the bagpipe, and he is a member of the pipe and drums band of the 48th Highlanders.

THE SEARCH FOR EARLY MAN IN ONTARIO

When and how did man first come to this Province

by Peter Storck

Assistant Curator,
Office of the Chief Archaeologist

There once was a time when man was a stranger in North America. For man did not evolve in the New World but on the savannahs of Africa where his evolutionary past goes back some two million years to the beginnings of the Ice Age.

How and when did man arrive in the New World? It is not too difficult to answer the first part of this question. At various times during the Ice Age vast amounts of water were withdrawn from the seas to feed the ice sheets and the shallow continental shelf between Siberia and Alaska was exposed as dry land, several hundred miles wide from north to south. This land bridge between two continents—called Beringia after the Bering Straits—was possibly used by several different "waves" of hunters who crossed over into the New World at various times.

The question of when man first arrived in the New World is more difficult to answer. Hunters from East Asia—possibly China—may have crossed over the Bering land bridge into the Americas as early as 40,000 years ago. However, the earliest well-established time of entry into the New World occurred sometime prior to 12,000 or 15,000 years ago, with the arrival of plains-adapted big game hunters. The impetus for this "wave of migration" occurred some 30,000 or 40,000 years earlier, when

Fluted point from Ontario. The flute was formed by the removal of a single large flake by a blow or pressure directed at the base. This fluting or channel flake removed part of the base itself, partly accounting for its concave outline, and extended almost to the tip before it hinged outward and broke off. The opposite face also exhibits a flute of similar size. This point is somewhat similar to the so-called Cumberland fluted point which is distributed throughout much of the southeastern United States.

hunters on the edges of the central and eastern European plains developed the first known stone projectile points and specialized tools for cutting bone and antler. For the first time in human history, man had the capacity to hunt and survive on the vast cold Eurasian plains densely populated with herds of big game animals. In time, drawn increasingly eastward by the richness of the plains, small bands of hunters crossed the Beringian land bridge, moved south onto the North American plains, and ultimately populated a continent.

There is abundant evidence that by 10,000 to 12,000 years ago these hunters, called Paleo-Indians, were present throughout a large part of North America south of the ice sheets and even penetrated into Mexico. In western North America these people hunted some of the largest and most distinctive mammals of the closing phase of the Ice Age—the Columbian and Imperial mammoths, several extinct forms of bison, and occasionally even the horse and camel. Although we have little evidence of this, small game hunting and trapping must also have been important and at times perhaps even critical to survival when large game could not be found.

The earliest Paleo-Indian hunters to appear in Ontario made very distinctive stone spearheads commonly called "fluted points". Several different styles or techniques of fluting have been recognized but on what might be regarded as the most developed form of fluted point—the Folsom point of western North America—a single large flake was removed from both faces of the point by blows or pressure directed at the base. This produced flake scars or "flutes" which sometimes extend almost to the tip and are only slightly narrower than the point itself. Most other styles of fluted points exhibit shorter and narrower flutes which were formed by the removal of a single flake or several overlapping flakes. It has been suggested that these flutes were "blood-gutters" intended for the purpose of allowing the wound to bleed more freely. Actually, however, the fluting probably had the more prosaic function of thinning the base and mid-section of the point so that it could be more firmly embedded in a wooden shaft.

No fluted point sites have as yet been excavated in Ontario and the only evidence we have that early Paleo-Indian hunters were in fact here is the small number of surface finds of isolated points reported by farmers and other people who recognize their scientific value. Most of the fluted points reported have come from extreme southwestern Ontario south of a line extending westward from Hamilton to Lake Huron. Only a few widely-scattered finds have been reported from elsewhere in the province and, with one or two exceptions, these are all in the south. Whether or not this represents the true distribution of fluted points and their makers cannot be determined until a larger number of points is reported.

Following the fluted point hunters in time,

Late Paleo-Indian (Scottsbluff) projectile points from southeastern Saskatchewan. The second specimen from the left is slightly over four inches long. McKillop collection, ROM.

Late Paleo-Indian peoples began moving into Ontario from the west and south by at least 9000 years ago and are identified by a variety of non-fluted, lanceolate or leaf-shaped projectile points.

While Early Paleo-Indian peoples in Ontario are as yet represented only by surface finds of projectile points, Late Paleo-Indian peoples are known from three sites which were excavated in the 1940s and 50s. Perhaps somewhat surprisingly, all are located in northern Ontario. These are the Brohm site on the north shore of Lake Superior approximately thirty miles east of Thunder Bay, the Sheguiandah site near the small community of that name on the northeast corner of Manitoulin Island, and the George Lake 1 site in the southern part of Killarney Provincial Park on the mainland across from Manitoulin Island.

The Brohm and George Lake 1 sites occur on ancient beaches which today are as much as 300 feet above the levels of Lake Superior and Lake Huron. These beaches were deposited by much higher water levels of lakes which existed between approximately 8000 and 9000 years ago. These dates provide a maximum possible age for the sites if they were occupied at the time the beaches were forming or shortly thereafter. The sites could, however, have been occupied much later in time. Unfortunately, no charcoal or bone was recovered for C^{14} dating and the only way in which the sites can be dated is by comparing the tools with those from other sites which have been securely dated. Related peoples in the West, referred to by the term Plano, made projectile points be-

tween 8000 and 9000 years ago which are similar to those found at the Brohm and George Lake 1 sites. Consequently, the geological dates for these sites appear to be correct indicating that Late Paleo-Indian hunters did in fact camp on the shores of these ancient lakes. In fact, this association of Plano-like peoples with ancient lakes in the Great Lakes region suggested the name by which they are known, Aqua-Plano.

Although the Sheguiandah site is not located on an ancient beach, a maximum date for the earliest Paleo-Indian occupations can, nevertheless, still be obtained on the basis of beach ridge chronology. The site would probably have been under the waters of several post-glacial lakes until perhaps 8000 or 9000 years ago when falling water levels exposed the area to occupation by man. The site was probably occupied by Aqua-Plano hunters at this time. Like other peoples over the next several thousand years, they were probably attracted to the white quartzite outcrop at Sheguiandah because of the abundance of raw material for fashioning tools—raw material which was only locally available on an island composed largely of dolomitic sedimentary rocks. Aside from several lanceolate points, the Aqua-Plano hunters probably also made at least some of the large number of bifacial "hand-axe-like" tools of quartzite. Somewhat similar tools, or blanks from which tools were to be made, were also found at the George Lake 1 site across the channel in Killarney Park.

Other quartzite tools from lower levels at Sheguiandah occurred in what are regarded as

Close-up of second specimen from the right on page 21; shows the high quality of flaking found on many points of this and related types.

glacial deposits originating from an ice advance 30,000 or more years ago. It has been suggested that these tools represent an even earlier occupation by man elsewhere in the region and that the artifacts were picked up by this ice advance and transported a short distance to Sheguiandah where they happened to be deposited. Although this interpretation has not been generally accepted, at least one prominent archaeologist has included the site in a long list of other sites from both North and South America which suggest to him that man crossed over into the New World long before the earliest Paleo-Indian hunters appeared. Sheguiandah may or may not be evidence for this but it is becoming increasingly clear that man's antiquity in the New World has been underestimated.

No sites in Ontario have yielded preserved bone indicating what animal species Early Man in this region actually hunted. In fact very little is known about Early Man as a hunter in eastern North America, which is in striking contrast to the comparative wealth of information available from a large number of Paleo-Indian kill-sites in western North America. The early fluted point hunters in the southwestern United States hunted mammoth and it has been suggested that perhaps related peoples in the Great Lakes area hunted mastodon, a distant relative of the mammoth. In Michigan, the distribution of fluted points is very similar to the distribution of mastodon remains and a similar pattern appears to occur in southwestern Ontario. However, no definite association of human artifacts with mastodon remains has yet been reported and, aside from the distribution studies, the only evidence that Early Man may have hunted this species is the discovery in a Michigan bog of a mastodon which may have been butchered.

In recent years, barren ground caribou has been reported from two Early Man sites in the Great Lakes region—the Holcombe beach site in southeastern Michigan and the Dutchess Quarry Cave in New York. On the basis of geological age estimates the Holcombe site may have been occupied as early as 11,200 years ago while C^{14} dating indicates that the Dutchess Quarry Cave was occupied some 12,500 years ago. The intriguing possibility that Paleo-Indians hunted barren ground caribou could have special significance for Early Man studies in southern Ontario for reasons which I will discuss somewhat later.

Where might we find other sites in our efforts to learn more about Early Man in Ontario? The field of Pleistocene geology offers at least a partial answer to this question for Paleo-Indian hunters moved into Ontario during the time of dramatic environmental change which marks the end of the Ice Age and the beginning of the Recent geologic epoch. The continental ice sheets were gradually retreating northward despite periodic local re-advances, new drainage systems were being formed, and ice-choked glacial lakes were alternately rising and falling

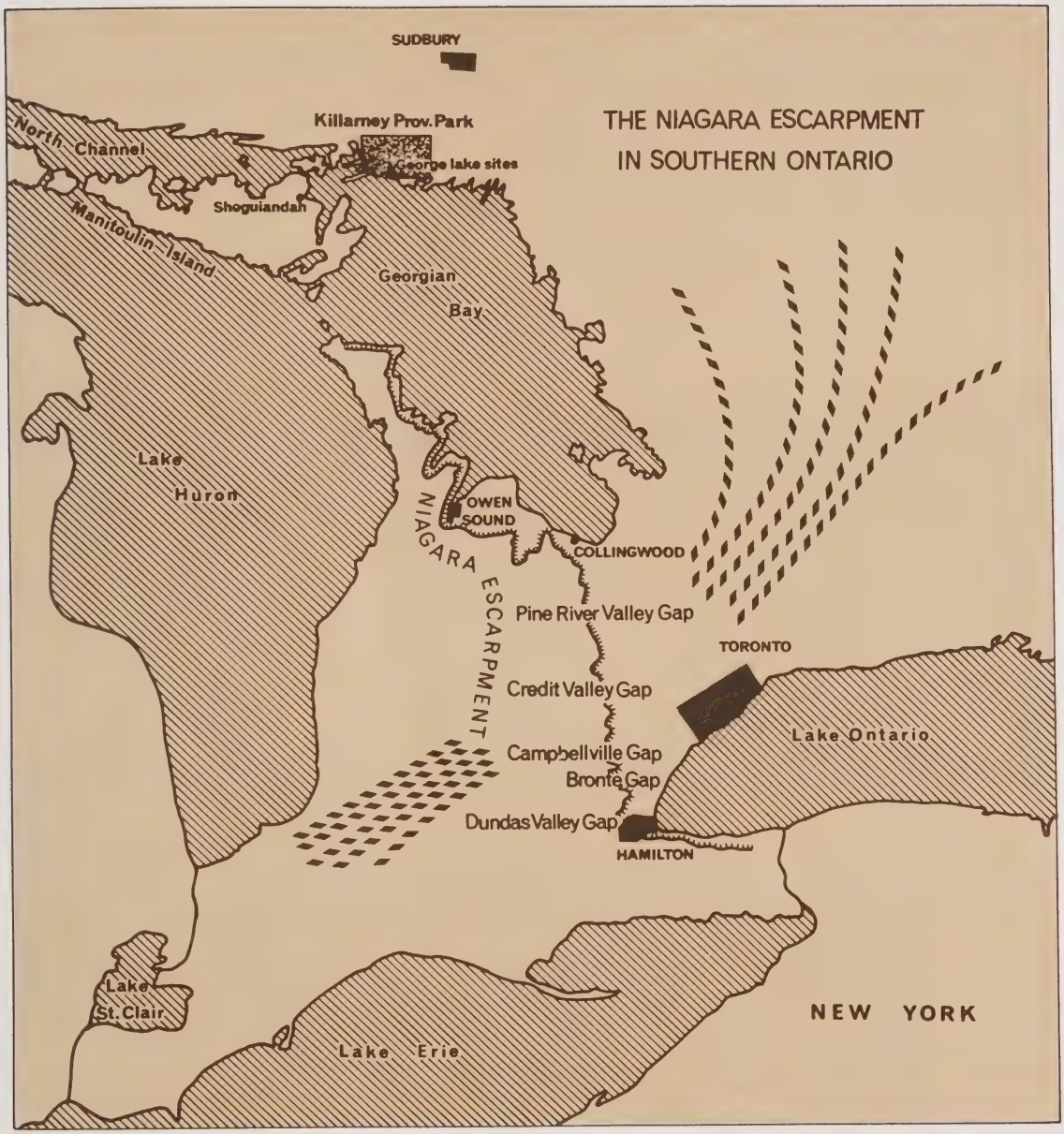
Late Paleo-Indian (Aqua-Plano) projectile points from Ontario. The specimen on the left is from Brant County; the two on the right are from the Rainy River area near the border of Ontario, Manitoba, and Minnesota. The middle specimen is about three and one-half inches long.

to new levels. To the geologist, the terraces and rolling hills of southern Ontario are not simply sources of sand and gravel but are "fossil landforms" providing a record of ice advance and retreat and the succession of glacial and post-glacial lakes. Once this record is fairly well understood, land surfaces which were formed during the time when Paleo-Indian hunters may have been in the area, such as glacial lake beaches and terraces along meltwater spillways, can be explored for any campsites which may be present.

I had this in mind in 1970 when I conducted a three month survey in the rugged hilly region of the LaCloche Range in Killarney Provincial Park. As I wrote in an Archaeological Newsletter at the time, my assistant and I were in some ways "beachcombing into the past" since we were looking for sites on ancient beaches deposited on the slopes of the LaCloche range by high water levels of glacial and post-glacial lakes. We were hoping to find the campsites of peoples related to those who visited the not too distant Sheguiandah and George Lake sites. One site we located was on an ancient beach some 200 feet above the present level of Georgian Bay and, of the small collection of flakes and other artifacts excavated, a single large roughly-shaped biface brought to mind those at Sheguiandah and George Lake. Unfortunately, there were no other tools which would have been more diagnostic for comparative purposes and the absence of charcoal from a firepit precluded any possibility of accurately dating the occupation.

Despite our initial lack of success, it would certainly be worthwhile surveying other beaches in this area and elsewhere in Ontario. The beaches of glacial lakes Algonquin and Iroquois in southern Ontario, for example, would be particularly interesting. Lake Algonquin occupied the Michigan and Huron basins between approximately 11,500 and 12,500 years ago and Early Man sites in both Michigan and Wisconsin have been found on beaches associated with stages of this lake. Lake Iroquois occupied the Ontario basin approximately 12,500 years ago and today sections of the Queen Elizabeth Way between Toronto and Hamilton parallel a prominent beach deposited by this lake.

There is another way, possibly more direct, in which we can approach the problem of finding

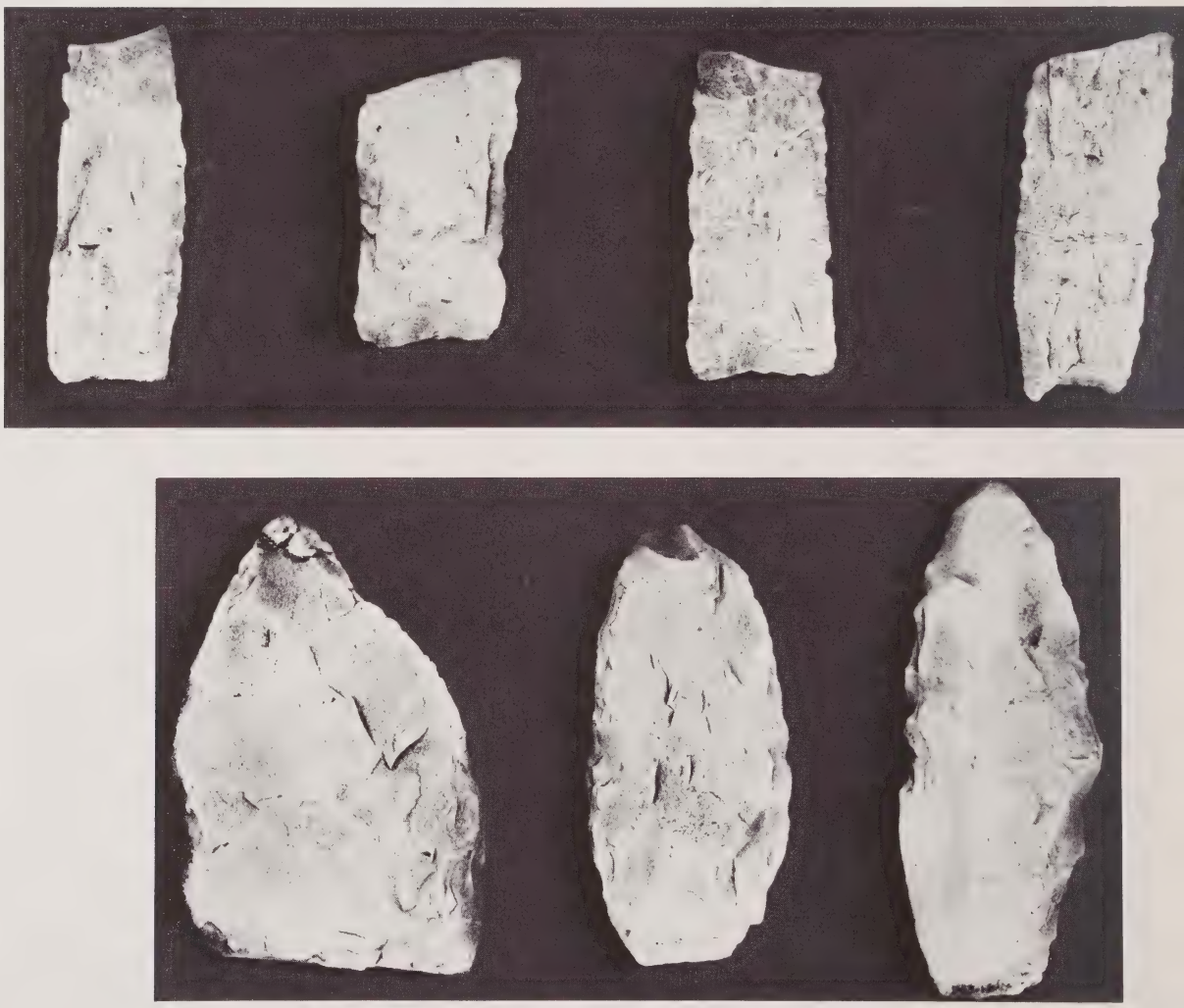


It is the author's theory that caribou migrated seasonally through the gaps in the Niagara Escarpment and that early Ontario man also followed these routes.

Early Man sites. The relatively recent discovery that Paleo-Indians 11,000 to 12,000 years ago may have hunted barren-ground caribou in the Great Lakes region provides a particularly important lead for future work in Ontario. In order to explain why, it is necessary to consider both the habits of barren-ground caribou and the geography of the southern part of the province.

Barren-ground caribou are widely known because of their seasonal migrations in large herds from their summer range and breeding grounds on the central Canadian tundra to their winter range along the edge of the boreal forest. If the behaviour and habitat of barren-ground caribou in the Great Lakes region 11,000 to 12,000 years ago was similar to that of the living species, then large herds may have passed through southern Ontario moving to and from their summer range on the tundra adjacent to

Lanceolate projectile points and bifaces of white quartize from the site of Sheguiandah on Manitoulin Island. Photograph by B. Leech.



the continental ice sheet. Roughly 12,500 years ago the ice front occupied a position north of Orillia and Peterborough and by 11,000 years ago this front had retreated to the area of North Bay causing a similar northward displacement of the tundra.

Migrating herds of caribou moving across southern Ontario would have had to contend with a major geographic feature which in some areas would have been a barrier to east-west movement—the Niagara escarpment. Extending from the Niagara River in the south to the northern tip of the Bruce Peninsula, the Niagara escarpment marks the edge of an upland region which rises 350 feet above Lake Ontario in the south and some 1000 feet above the eastern lowlands in the region of Collingwood. The escarpment is sharply defined on the Niagara peninsula and along the shores of Georgian Bay where it often forms vertical cliffs several hundred feet high. In these areas, the only routes through the escarpment are gaps such as the Dundas valley west of Hamilton, the Bronte valley, the Campbellville gap near Milton through which Highway 401 passes, and the Credit valley at the Forks of the Credit to name only some of the more prominent in the south. Caribou would have been forced to use these gaps and this in turn would have attracted Early Man. If this reasoning is correct, a thorough search of the major gaps in the escarpment should locate Paleo-Indian campsites.

Work began on this project only last summer. After walking along sections of the Bruce Trail and working in several gaps in the southern part of the escarpment, I am encouraged that these and other gaps are indeed places where we might effectively concentrate our search for Early Man. Work will continue on this project for a few weeks each summer over the next several years until all major gaps in the escarpment from the Niagara River to the Bruce Peninsula have been surveyed. Work will also continue, of course, on ancient beach ridges both in southern and northern Ontario. Perhaps during our next field season, while walking alongside an old gametrail through the Niagara escarpment or back and forth through the rows of a cornfield on an ancient beach, I will suddenly step back in time and into the life of Early Man.

Peter Storck was born in southern Wisconsin in 1940. He received his B.Sc. in 1963 and his M.Sc. in 1967, both from the University of Wisconsin, Madison, and is presently completing his Ph.D. He has extensive training in natural sciences, including geology.

Mr. Storck has done yearly field work since 1960 on archaeological sites ranging in age from 11,500 to 600 years ago, and varying in location from southern Alaska to Central Mexico. In the fall of 1969 he joined the staff of the Royal Ontario Museum where he is Assistant Curator in the Office of the Chief Archaeologist.

Mr. Storck is married but has no children. His wife, Becky Sigmon, is Assistant Professor in Physical Anthropology at the University of Toronto.

COL. R.S. McLAUGHLIN

A 100th birthday tribute

In his youth, Mr. McLaughlin won many bicycle racing awards, and often rode this "penny-farthing" as far as 60 miles.

September 8 was the one hundredth birthday of a man noted for business acumen, concern for excellence, and philanthropic generosity—Robert Samuel McLaughlin, chairman of the board of General Motors of Canada and former Vice-President and Director of General Motors Corporation. The Royal Ontario Museum has particular reason to be grateful for his qualities.

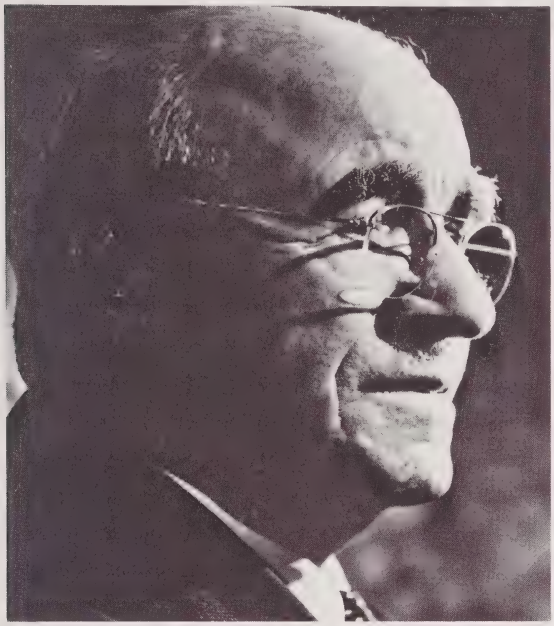
Mr. Sam (a nickname from his apprentice days) has always enjoyed people, and accords the same warm interest to all he meets. He also enjoys the challenge of commerce. At the age of 98 he was still coming in to his Oshawa office every day. Since last year he has taken things a bit easier, keeping tab on events by telephone rather than in person.

R. S. McLaughlin was born in 1871, in the village of Enniskillen, north of Oshawa. He was the youngest of three sons of Robert McLaughlin, a farmer turned carriage maker who founded the McLaughlin Carriage Works in 1867 and supplied quality sleighs and wagons to an increasingly large market. When McLaughlin was five, the carriage works moved to Oshawa, and at sixteen he was apprenticed to its upholstery shop. After his apprenticeship, he became a journeyman in carriage works in New York State before returning to Oshawa. In 1892 he and his brother George were made partners in the McLaughlin Carriage Company. By 1899 he was chief designer of McLaughlin cutters and carriages, and had been a year married to Adelaide Louise Mowbray, who was to give him five daughters.

About the turn of the century Mr. Sam became convinced that the noisy snorting newfangled motor car was to become serious competition for horse-drawn vehicles. His holidays were spent visiting motor-car manufacturers in the United States, and he soon decided that the McLaughlins must get into the mushrooming automobile business.

In 1908 the McLaughlin Motor Car Company was formed, with Mr. McLaughlin its president. By agreement with Buick of Flint, Michigan, Buick engines and other parts were to be put into McLaughlin bodies. Until metal replaced wood in body construction, many models were designed by McLaughlin himself, a task he thoroughly enjoyed. The motto of his father's carriage works had been "One grade only, and that the best." The same feel-

Col. Robert Samuel McLaughlin, C.C., E.D., C.D., Ll.D., HON. F.R.C.S. (C)
Photo by Cavouk



ing pervaded the McLaughlin Motor Car Company, and Mr. Sam prided himself that McLaughlins were fancier and better finished than Buicks.

In 1910 Mr. McLaughlin was made a director of General Motors Corporation, and in 1918, for various reasons, the McLaughlin Motor Car Company was sold to General Motors. Mr. McLaughlin became President of General Motors of Canada, a position he held until the end of World War II. During the war, the General Motors plant at Oshawa produced streams of vehicles, guns and gun mounts, shells and bomber fuselages for the Canadian war effort. Mr. Sam himself stored his automobile for a time and came to work each day in a horse and buggy.

That horse and buggy is a clue to his wide-ranging interests. In his youth he had been a keen bicyclist, winning many races at country fairs, and often making the 70-mile round trip between Oshawa and Toronto in one day, just for exercise. Jumpers from his Parkwood Stables, usually ridden by his daughters, won many trophies and ribbons. His racing yacht was champion of the Great Lakes for its class in 1924. In thoroughbred racing, his colours entered the winner's circle for three King's Plates—1934, 1946 and 1947. Mr. McLaughlin has also been a keen golfer and fisherman, a curler and a bowler.

His concern for excellence and his generosity are nowhere more evident than in the long list of his philanthropies. He has donated several millions of dollars to educational and charitable causes. McLaughlin gifts have financed hospital wings in Oshawa and Toronto, a Canada-wide trust fund enabling doctors to study overseas, buildings at Queen's University, York University and the University of Montreal, the Oshawa McLaughlin Public Library, the YMCA building there, Boy Scout camps and a building for the Girl Guides of Canada.

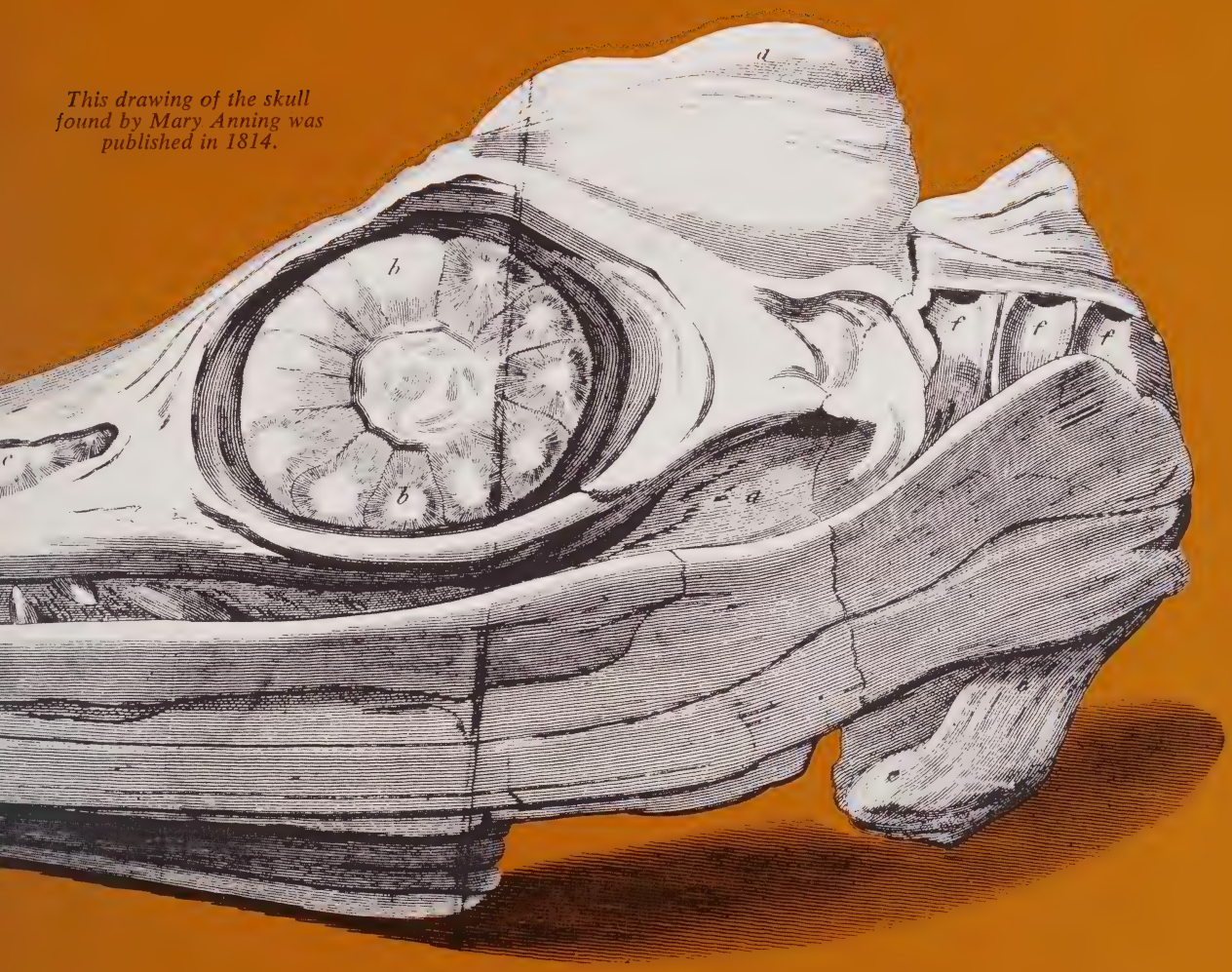
The ROM too has much cause to be grateful for Mr. McLaughlin's generous impulses. He had long admired the Hayden Planetarium in New York, which was funded by a close friend, and wished to establish a similar planetarium in Canada. Unfortunately in the aftermath of World War II the intricate planetarium projectors were unavailable. When they were again in production, McLaughlin wrote to the University of Toronto offering to fund the building of a planetarium associated with the University and the Museum. The offer was gladly accepted, and in November 1968 the $2,000,000 McLaughlin Planetarium opened. Mr. Sam's instructions were to make it the best, and to ensure that running expenses would be met, he set up an endowment of an additional $1,000,000. Three years later, he made a contribution of $175,000 toward the construction of the new ROM restaurant complex which opened in the spring of this year.

"I want everything to be of the highest order and first-class in every way"—so wrote Mr. Sam, outlining his plans for the McLaughlin Planetarium. The sentence may well sum up this distinguished centenarian's life-long approach to the products of his factories, to the competitive world of bicycle racing, swift yachts and fine horses, to the provision of war material in 1939-1945, and to the quality of his fellow man's life, whether in education, medicine, or public service.

SEA DRAGONS OF THE MESOZOIC

The enigma is, why are they now extinct?

by Dr. C. McGowan
Assistant Curator,
Dept. of Vertebrate Palaeontology



This drawing of the skull found by Mary Anning was published in 1814.

The Mesozoic Era, which began some 200 million years ago, is often referred to as the Age of Reptiles. The reptiles marked a milestone in the history of the backboned animals for, unlike their amphibian ancestors, they did not have to return to water to breed. With this, and many other advantages, the reptiles were able to occupy every conceivable niche. Reptiles roamed the land, some lived in the sea, while others soared in the skies above. But time did not stand still for them, and they in their turn were succeeded. It was the mammals, with their ability to regulate their body temperature and bear their young alive, who inherited the Earth from the reptiles at the close of the Mesozoic.

Most of our knowledge of Mesozoic reptiles is obtained by studying their bones. Since there is much confusion over what fossil bone actually is, it will be worth looking into the matter.

Bones never turn into stone. They may become very hard, very dense, but they never turn into something else. In fact it is remarkable what little change does occur. Fresh bone consists essentially of two substances, collagen and apatite. Collagen is a rubbery substance which gives the bone its resilience, while the hard mineral, apatite, provides strength. Bone is a living tissue and living cells occur throughout its substance. These cells lie in small spaces and are nourished by blood vessels which ramify throughout the bone. When an animal dies, the bone cells and blood vessels break down, and the bone dries out and becomes quite porous. The collagen breaks down too, but far more slowly, and the bone becomes progressively brittle. The mineral portion of the bone remains unchanged. Eventually the collagen-free bone disintegrates, and is lost forever.

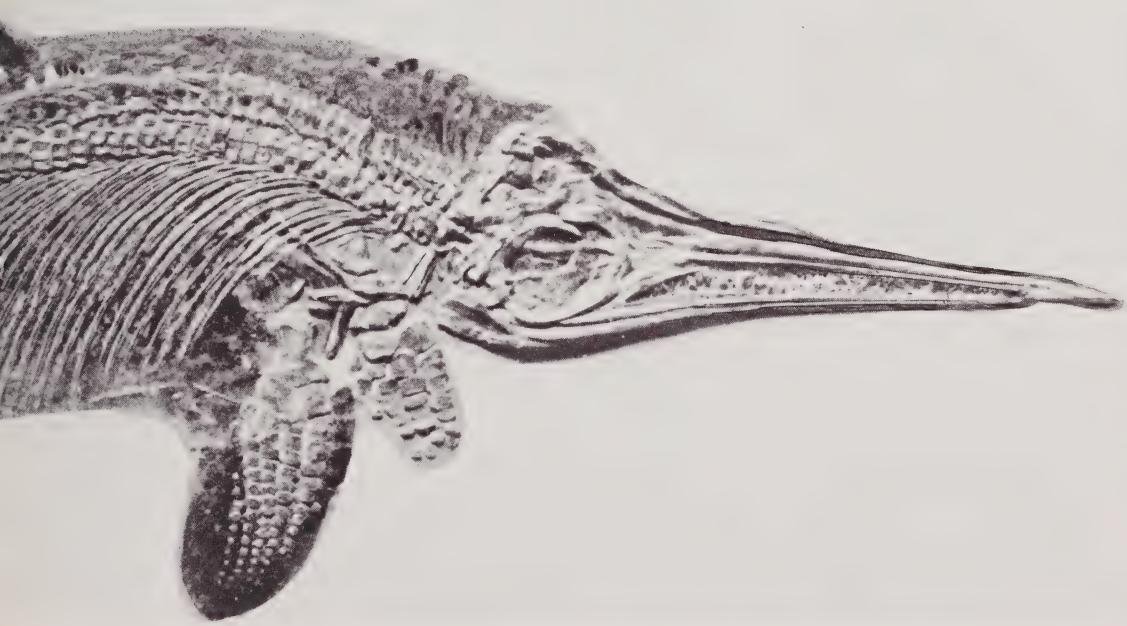
Under certain conditions, however, the pores

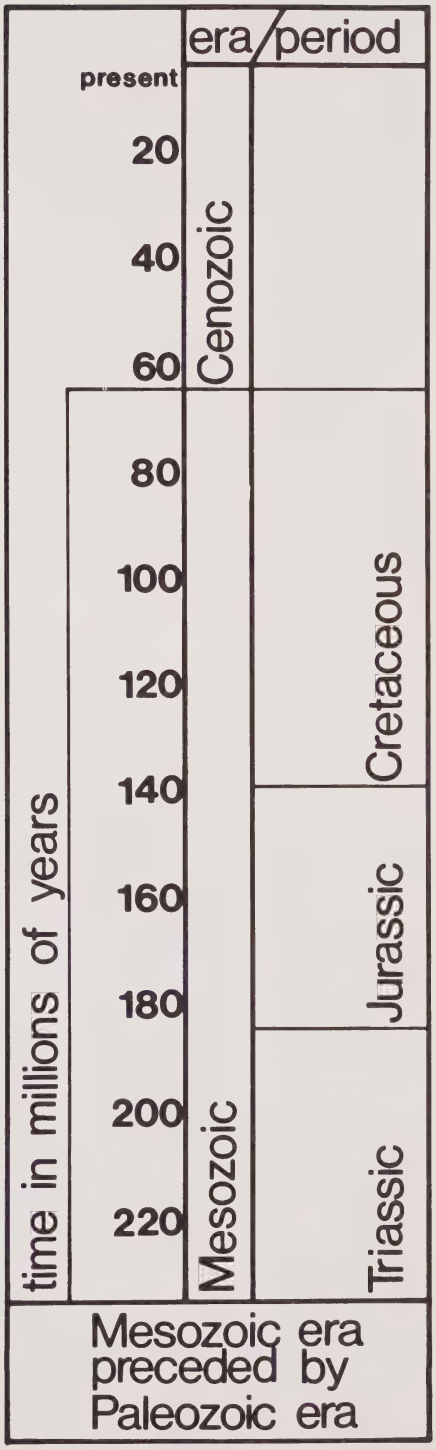
A Jurassic ichthyosaur. The body outline is preserved as a thin black film of carbon.

within the bone become filled, thus strengthening the bone and preserving it. The infilling is usually by minerals which have been carried into the bone in solution and then crystallised out. The crystals fill even the smallest spaces within the bone. It is this process of infilling which increases the density of fossil bone and often gives it a stony appearance. These events are very rare and take millions rather than thousands of years. The original apatite of the bone, as mentioned previously, remains unchanged, and the microscopic structure is almost always preserved.

From a study of these preserved bones, together with certain other pieces of information, it is possible to piece together a picture of life in the remote past. A brief look at a group of reptiles, the ichthyosaurs, will illustrate how this can be done. Ichthyosaurs lived in the sea, and were very highly adapted to their environment. Their bodies were very streamlined, their arms and legs had become fins, and they propelled themselves with a large tail. They were very fish-like in their appearance, hence the name ichthyosaur, meaning fish-lizard.

The ichthyosaurs first appeared during the Triassic Period, about 200 million years ago, but they were most abundant during the early part of the Jurassic (120 million years ago). They are found throughout most of the Jurassic and much of the Cretaceous but, like the dinosaurs, disappeared forever before the end of that Period. They are found almost throughout the world. Many of the ichthyosaurs were giants. North American species reached lengths of 20 feet and more, while European species tended to be smaller. Most of our knowledge of ichthyosaurs comes from a study of the Early Jurassic species, which were amongst the smallest, most numerous, and





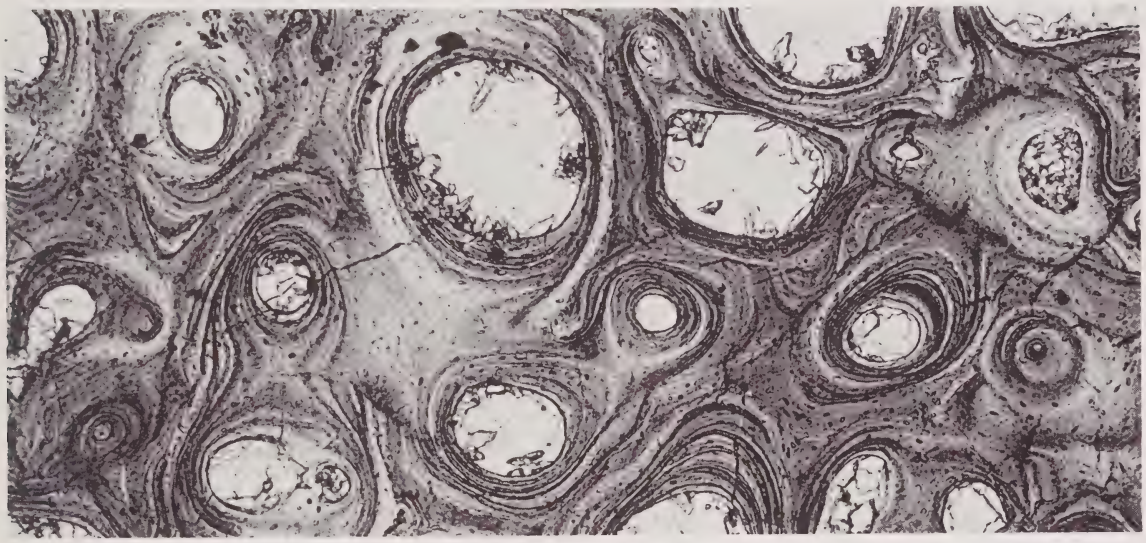
Geological time scale.

often the best preserved of all skeletons. The first ichthyosaur ever found was of early Jurassic Age.

The story of the discovery of the first ichthyosaurs was set in England. In the year of 1811 a young girl of 12 came upon a large skull on the foreshore of Lyme Regis in Dorsetshire. It was quite large, measuring some 5 feet in length, and looked something like a giant fish. The girl's name was Mary Anning, and she was looking for fossils in order to augment the family's income, because such curiosities could be sold in the village to visitors. Her father had shown her where and how to look for fossils, and on this occasion she was more fortunate than usual. She sold the skull for twenty-five pounds to Henry Host Henley, upon whose estate it had been found. It subsequently found its way into the museum collection of a showman named Bullock. Sir Everard Home, an anatomist, was privileged to examine the specimen and he described it in a paper which appeared in 1814. The unique nature of the specimen was recognised, and Sir Everard wrestled with the problem of its affinities for the next six years. Meanwhile, Mary Anning continued collecting fossils, becoming widely acclaimed and respected. Among her accomplishments was the discovery of the first plesiosaur and of the first pterosaur. She died in her mid-forties and is commemorated by a stained glass window in the local church.

During these early days of discovery there was a good deal of confusion in the interpretation of the skeletons being found. For example, a downward bend of the vertebral column in the tail region was interpreted as a post-mortem effect, and skeletons were sometimes restored with the vertebral column straightened out. Only when a specimen was found in which the body outline was preserved as a carbonaceous film, was it realised that the "break" was natural, and an integral part of the tail. Early workers visualised that ichthyosaurs hauled themselves up on land to breed, like seals and turtles, and this view is reflected in a cartoon penned by De La Beche, an early investigator in the field of ichthyosaurs. If we look closely

Thin section of dinosaur bone, magnification 70X. The large round holes were in life filled with blood, and are now filled with calcite. The dark grey areas are of apatite, and the very small dark granules are the spaces once occupied by bone cells.



Man Found only in a Fossil State—Reappearance of Ichthyosauri

De La Beche's cartoon.

A LECTURE: "You will at once perceive", continued Professor Ichthyosaurus, "that the skull before us belonged to some of the lower order of animals; the teeth are very insignificant, the power of the jaws trifling, and altogether it seems wonderful how the creature could have procured food."

at an ichthyosaur skeleton we see that neither the hip or the shoulder girdles have very much area of contact with the vertebral column and it is unlikely that they could have supported their weight on land. Furthermore, we know that ichthyosaurs did not need to return to land to breed like other marine reptiles because they bore their young alive. At least one specimen has been found which died giving birth, and the infant can clearly be seen half emerged into the world it never knew. Like whales, ichthyosaurs were born tail-first, an adaptation to prevent drowning of the infant during birth.

A great deal of information about an animal can be gained from a study of its skull, and it is fortunate that some ichthyosaur skulls have been so well preserved as to permit a very detailed study. From bony impressions in the underside of the skull roof we can reconstruct an approximate picture of the brain of the living animal. It is not surprising to find that the optic lobes (that part of the brain associated with sight) are the largest part of the brain, because ichthyosaurs had enormous eyes. The olfactory lobes (associated with the sense of smell) were moderately well developed, but it would seem that this sense was probably subordinate to sight. And what of hearing? For reasons too involved to discuss here, it is important for animals which use their ears underwater to have the sensory parts of their ears isolated from one another. In the toothed whale, which has a highly evolved echo-location apparatus, the otic capsules (bony capsules enclosing the cochlea) are surrounded by an insulating layer of foam and do not make direct contact with the rest of the skull. In the ichthyosaur skull, the two otic capsules are braced firmly against the rest of the skull and thus in bony contact with one another. Their hearing abilities must have been strictly limited, or entirely absent. Ichthyosaurs, therefore, relied almost entirely upon their keen sight for locating their food.

What food did they eat? We can see from the skull that ichythyosaur teeth were numerous, sharp pointed, and intermeshing top with bottom. The snout and lower jaw are very long and slender, and the muscles which close the mouth were inserted very close to the jaw joint (muscle insertion areas show up as scars on the bone surface). By simple mechanics we can deduce that the jaw functioned as a fast snapping apparatus, indicative of a fish eater. This conclusion has been confirmed by studies of preserved stomach contents which contain fish scales and large quantities of belemnite hooklets (belemnite were very much like squids). The fish scales can be identified as belonging to a species of fish which was very much like the herring and among the fastest fishes of those times.

Ichthyosaurs themselves were swift swimmers, obtaining propulsive thrust from their big tails. In addition to providing a forward thrust, the tail gave a downthrust, the significance of which might not at first be apparent. However, we must remember that ichthyosaurs were air breathers, whose density was less than that of sea water. The buoyancy of their bodies would raise problems when they dived beneath the surface for food, and these were solved by the downthrusting tail. However, since the tail is set behind the centre of gravity, the downthrust produced would cause the animal to rotate very rapidly about its centre of gravity. This altogether unsatisfactory arrangement was overcome by the fore limbs which, functioning as hydroplanes, produced a compensatory downthrust in front of the centre of gravity. By varying the pitch of the forelimbs, the swimming level could be adjusted, giving complete freedom of movement. The unsupported dorsal fin functioned as a stabilizer, correcting roll and yaw.

So successful were the ichthyosaurs in their adaption to the aquatic medium that their demise is difficult to comprehend. Competition with animals better adapted to living in the sea may be dismissed, because dolphins and porpoises did not appear until many millions of years after the extinction of the ichthyosaurs. Detrimental changes in the relatively stable environment of the sea are difficult to imagine, notwithstanding the improbability of such changes affecting all seas. For the time being, perhaps for always, the extinction of ichthyosaurs will remain an enigma.

Posterior view of an incomplete ichthyosaur skull. The otic capsule of the right side is the triangular bone lying above the arrow point.

Christopher McGowan, Assistant Curator, Department of Vertebrate Paleontology, was born in the county of Kent, England in 1942 and spent his undergraduate and postgraduate years at London University where he received his Doctorate. During his student days he hesitated between the charms of Pleistocene pigs and those of Mesozoic ichthyosaurs. The ichthyosaurs prevailed.

The Growing Collections

Shortly before 1700, France displaced Italy as the source of rich fabrics, and Lyon became the silk weaving centre of the world, a position it still holds today. The magnificent fabrics produced there set the styles for courts of Europe for the next two centuries. During the past three years, a number of important additions have enhanced the ROM's collections of these superb materials. The most recent is one of the finest: a panel of cream damask richly brocaded with silver and multi-coloured silks. It dates from about 1700-1710, the early period of Lyonnaise production, and is a most generous gift from Mrs. W. B. Harris.

The ROM recently was given an 1881 letter from Sir Sandford Fleming describing the development in 1851 of the first adhesive postage stamps for the Province of Canada, and a beautiful three-penny stamp from the 1852 issue in the same design. They were donated by Miss E. Adele Harman, a granddaughter of the Hon. James Morris, Postmaster General of the Province in 1851. Mr. Morris conceived the idea of the central design—a beaver, symbolizing the hard work of building a young country and recalling the beaver-pelts as a medium of exchange for French and English adventurers in earlier days. Sandford Fleming, then a young immigrant draftsman and engineer, prepared the artwork for the stamp. He was later to figure in the ocean-to-ocean construction of the Canadian Pacific Railway, to devise the system of time zones, and to be knighted by Queen Victoria.

The collection of Victorian jewellery continues to grow in size and quality through the help of the Group of 100 and the Purchase Trust Fund. One of the recent important additions has been a spray brooch with *tremblant* flowers. It is of silver, backed with gold, and is richly set with mine-cut diamonds. It is probably English, dating from the 1870s.

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